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# WELDING



**State 4-H O-Rama**  
**Senior 4-H'ers**



## OVERVIEW

The welding contest is designed to give youth an opportunity to demonstrate their knowledge and skills in arc welding. Safety will be stressed throughout the contest.

## TARGETED LIFE SKILLS

Provided through this project area include: *Wise use of resources, planning/organizing, goal setting, critical thinking, problem solving, decision making, learning to learn, self-esteem, leadership, cooperation, social skills, time management, career exploration*

## OBJECTIVES

1. To show skill(s) in the safe handling and application of Arc Welding, equipment and supplies.
2. To show skills in selecting and utilizing Arc Welding equipment and supplies.
3. To show skills in making a weld bead in the flat position, a square groove welded, butt joint in the flat position, and fillet welded, corner joint in the vertical position - up direction.

## ELIGIBILITY

Each county may enter no more than two senior 4-H members in the 4-H Welding contest at the Arkansas 4-H O-Rama. No individual who has previously won first place in this activity is eligible to compete. Scores of the competitors will be ranked individually.

## ACTIVITY

This contest will include (*time limits as shown*):

1. Written Examination (*20 minutes*)
2. Shielded Arc Metal Welding skills event (*30 minutes*)
3. Identification (*15 minutes*)

Designated judges will preside over the event and their decisions will be final.

#### EVENTS

Written Examination  
SMAW Skills Event  
Identification Test

#### PENALTY POINTS

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#### Event No. I - Written Examination

Will consist of 25-30 multiple choice, true-false and/or fill in the blank questions. Included will be questions on safety, equipment, methods, power sources, weld types and weld quality. The questions will be based on the reference source: Arcs and Sparks, Shielded Metal Arc Welding (4-H 573) from The Ohio State University Extension. The reference materials can be obtained from the 4-H State Office or directly from Ohio State University Extension.

#### Rules:

1. Four penalty points will be given for each question answered incorrectly or unanswered.
2. Time limit is 20 minutes.

**Scoring:** Number of Questions Missed x 4 = Penalty Points

#### Event No. II - SHIELDED METAL ARC WELDING CONTEST (SMAW Skills)

For the SMAW skills event each welding contestant will demonstrate their SMAW ability by making **two** of the following welds: a 3" long bead on plate weld, a 3" long double square groove weld and a 3" long fillet weld. Welding will be done using a Shielded Metal Arc Welding Power Source and 1/8" diameter, AWS type E-6011 electrodes. The power sources, base metal, electrodes and fully equipped welding stations will be provided. Each contestant will be given a copy of **Welding Procedure for Event No. II - SMAW SKILLS** for study and use during event II.

**NOTE:** Each contestant will be suitably attired for SMAW, by wearing industrial quality eye protection, long sleeve shirt, long pants and high top foot protection (no athletic foot wear). Gauntlet leather welding gloves and welding helmets with a #10 filter plate will be provided but any welding contest participant may bring and use their own welding equipment. Contestants wearing shorts, short sleeved shirt or any inappropriate clothing or footwear will not be permitted to weld. Industrial quality eye protection (clear or shaded) will be worn in the contest area where the Weldment is being created and especially under the welding helmet during welding.

#### Rules:

1. One penalty point will be given for each evaluation point missed (100 - total evaluation points awarded).
2. Time limit is 30 minutes.

**Scoring:** Evaluation Points Missed x 1 = Penalty Points

## **Event No. III – Material & Parts Identification**

The proper identification of welding industry items will consist of 10 materials, tools, and/or parts to be identified by each contestant. There will be a predetermined list of materials, tools, and parts used for the contest (attached). The resource materials listed below will assist in the study process for this event.

### **SUGGESTED RESOURCES**

*4-H Arcs and Sparks, Shielded Metal Arc Welding (4-H 573)* from the Ohio State University Extension

*Lincoln Electric Guide for Safe Arc Welding*, [www.lincolnelectric.com](http://www.lincolnelectric.com)

### **AWARDS**

The high-point individual will receive a trophy. Individuals scoring second-, third-, fourth-, and fifth-place will receive ribbons. All others will receive participation ribbons.

### **PREPARED BY**

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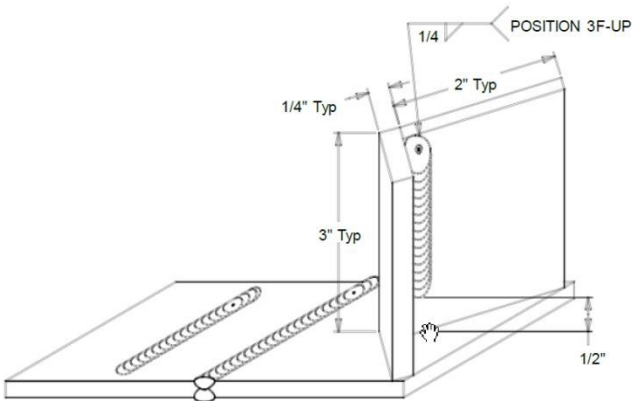
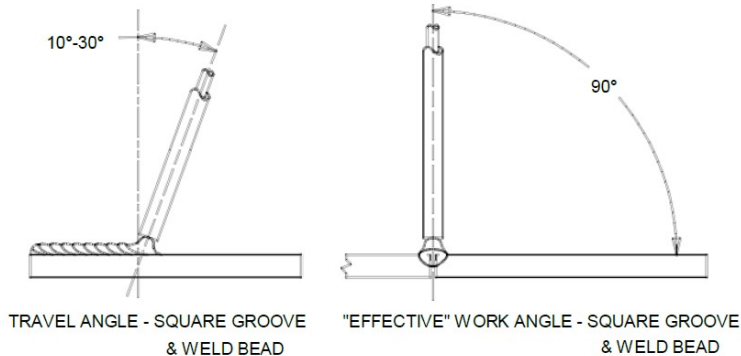
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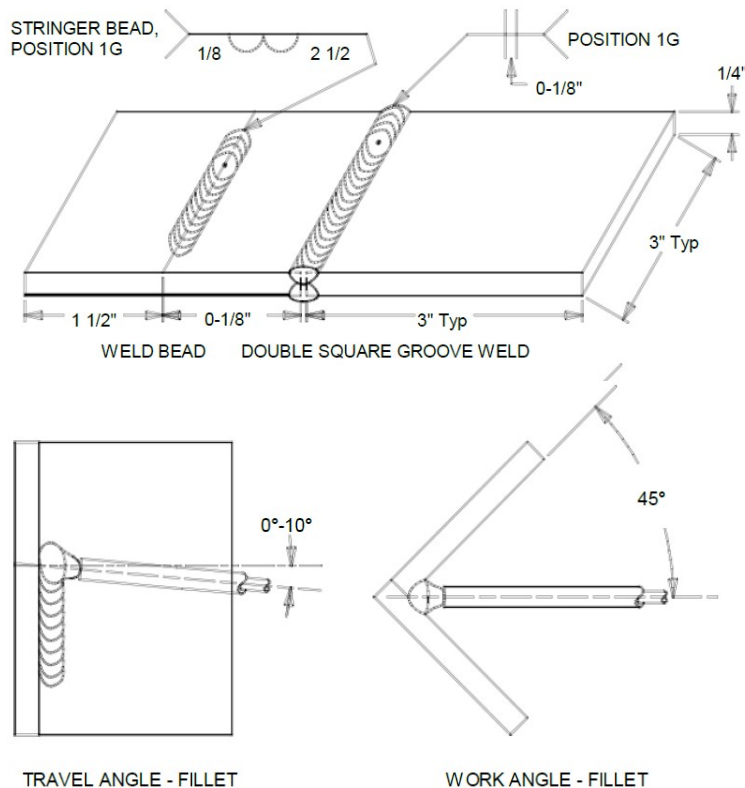
## NATIONAL YOUTH SHIELDED METAL ARC WELDING CONTEST PROCEDURE for Event No. II - SMAW SKILLS

1. To show skill(s) in the safe handling and application of SMAW equipment and supplies.
2. To show skills in selecting and utilizing SMAW equipment and supplies.
3. To show skills in making a weld bead in the flat position (1G), a square groove welded butt joint in the flat position (1G) and fillet welded, corner joint in the vertical position -up direction (3F-Up).

### Material and Equipment:

1. Metal - 3 pieces 3 inches x 3 inches  
2 pieces 2 inches x 3 inches
2. Filler metal - 1/8 inch diameter E6011 electrodes
3. Safety equipment (eye, face, hand, and body)
4. SMAW power source and equipment
5. Chipping hammers with wire brush
6. Combination and Vise-Grip™ pliers
7. Cooling and stub buckets
8. Welding table





## Procedure:

1. Determine that the low carbon steel base metal (1/4 inch thick) and filler metal (E-6011 electrode, 1/8 inch diameter) are sufficient and suitable for use.
2. Check the set-up of the SMAW power source and equipment. If not operating properly, ask for assistance.
3. Set the arc welding current selector of the power source to a value based upon the low carbon steel base metal thickness and the electrode (diameter) selected (use either 90, 105 or 120 AMPS). Use a 3x3 piece of base metal for setting power source and practicing welding.
4. Insert the electrode into the electrode holder at a 90° angle.
5. Start the arc by striking the electrode like a match. Using the backhand welding technique maintain a travel angle of 10°E - 30°E with an "effective" work angle of 90°E.
6. Hold a constant arc length (1/8 inch or equal to the diameter of the electrode core wire).
7. Use a uniform travel speed, ripples (with slag removed) will show a half moon or crescent shape.
8. Bead width, including the slag cover, should be approximately 2 but less than 3 electrode (coating) diameters wide.
9. When stopping the weld, raise the electrode slowly and go back over about 1/2 to 3/4 inch of the weld, then lift the electrode to extinguish the arc. This technique will provide filler metal to fill the weld crater as the weld pool solidifies.
10. After running a sample bead on your test plate; readjust the current selector, as necessary. If the electrode sticks to the base metal, increase the current setting. If the electrode spatters too much and the crater becomes too large, then decrease current setting.
11. For the **Weld Bead**, make a single pass across one 3x3 piece of base metal. The weld bead should be 2 1/2 inches long. The weld bead is to be made in the flat or 1G position. Make the weld after you have tacked the pieces together for the groove weld. See illustration.
12. For the **Groove Welded, Butt Joint**, space 2 pieces of 3x3 base metal, 1/16 to 1/8 inch apart or equal to the electrode core wire diameter. Then without changing the space between the two

pieces of base metal; tack weld both pieces of base metal together in the flat or 1G position. See illustration.

13. Now, make one pass on each side of the butt joint using the welding technique of Para 5 above. Before making the pass on the second side; clean the side, removing all slag at the root.
14. Hold the proper arc length (approximately 1/8 inch) with the arc pushed halfway into the groove. Travel fast enough to keep the arc at the front edge of the weld pool.
15. Allow the completed square groove weld to cool.
16. For the **Fillet Welded, Corner- Joint**, tack weld the 2 inch ends of the 2 pieces of 2x3 base metal to the middle of the 3x3 base metal (without the weld bead) forming a corner joint. See illustration.
17. Now, make a single pass fillet weld progressing vertically uphill (3F-up). Use the back hand welding technique with a slight weaving motion or using a whipping motion. Maintain a travel angle of 0E-10E with a work angle of 45E. Start the weld a 1/2 inch above the lower piece of base metal.
18. Hold a short arc length (no more than a 1/8 inch). Travel fast enough to keep the arc at the front edge of the weld pool and the weld pool under control.
19. Allow the completed weldment to cool. There should be three welds on the weldment - a weld bead, a double square groove weld and a single fillet weld.
20. Clean all welds with a chipping hammer and wire brush. Also, clean up all unused electrodes, electrode stubs and any other waste material by properly disposing of these items in the stub bucket.
21. Once the weldment has been cooled and cleaned, submit the weldment to your judge for evaluation.

**ARKANSAS 4-H SHIELDED METAL ARC WELDING CONTEST**  
**Event No. II - SMAW Skills**

**Evaluation:**

**Participant's Name** \_\_\_\_\_ **County** \_\_\_\_\_

<b>Considerations Comments</b>	<b>Possible Points</b>	<b>Weld: Bead/Groove/Fillet Points Earned</b>
1. Bead Width	1	____ / ____ / ____
2. Bead Height	1	____ / ____ / ____
3. Appearance - smooth & uniform	1	____ / ____ / ____
4. Face of weld - slightly convex, free of porosity and free of excessive reinforcement	1	____ / ____ / ____
5. Edge of bead – no over lapping or undercutting	1	____ / ____ / ____
6. Start and Stop – full size	1	____ / ____ / ____
7. Followed Welding Procedure	2	____ / ____ / ____
8. Safety Practice	2	____ / ____ / ____
<b>Subtotal</b>	<b>10</b>	____ / ____ / ____
<b>Weighting factor</b>		<b>X 2      X 4      X 4</b>
<b>Total</b>		____ / ____ / ____

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## WELDING PARTS & EQUIPMENT IDENTIFICATION

Score: \_\_\_\_\_

Name: \_\_\_\_\_

County: \_\_\_\_\_

**Instructions All Contestants:** Write the tag number on the line to the left of the most correct name for each part.

- |  |                                      |
|--|--------------------------------------|
| _____ Flat Soap Stone                      | _____ Flat Butt joint                |
| _____ Arc Welding Power Source             | _____ E-6010 Electrode               |
| _____ C-Clamp                              | _____ ABC Fire Extinguisher          |
| _____ Work piece Connection (Ground Clamp) | _____ Power Cord                     |
| _____ Electrode Holder                     | _____ Combination Square             |
| _____ 7" Angle Grinding Wheel              | _____ Lap Joint                      |
| _____ Stringer Bead                        | _____ Polarity Switch                |
| _____ Tee Joint                            | _____ Rod Stub Bucket                |
| _____ E-6013 Electrode                     | _____ Corner Joint                   |
| _____ Electrode Lead                       | _____ #10 Filter Shade Lens          |
| _____ Framing Square                       | _____ Tack Weld                      |
| _____ Clear Cover Plate Lens               | _____ Amperage Output Gauge          |
| _____ Gauntlet Leather Welding Gloves      | _____ Ground Lead                    |
| _____ Welding Jacket or Sleeves            | _____ Wire Brush                     |
| _____ Hand-Held Welding Shield             | _____ Round Soap Stone Holder        |
| _____ Industrial Quality Safety Glasses    | _____ Ear Protection                 |
| _____ Industrial Quality Safety Goggles    | _____ Fillet Weld                    |
| _____ Arc Weld Gauge                       | _____ E-6011 Electrode               |
| _____ Speed Square                         | _____ Leather Rod Pouch              |
| _____ Welding Shield or Curtain            | _____ Tongs                          |
| _____ Angle Grinder                        | _____ Magnetic Torpedo Level         |
| _____ 14" Chop Saw Blade                   | _____ Round Soap Stone               |
| _____ E-7018 Electrode                     | _____ Slip-Joint Pliers              |
| _____ Locking Plier (Vise-Grip)            | _____ Spring Handle Chipping Hammer  |
| _____ Ball Pein Hammer                     | _____ 4 ½" Angle Grinding Wheel      |
| _____ Flat Soap Stone Holder               | _____ Bench Grinder                  |
| _____ Power Switch                         | _____ Hack Saw                       |
| _____ Chop Saw                             | _____ Automatic Welding Helmet       |
| _____ Welding Cap                          | _____ Welding Helmet with Flip Front |
| _____ Tape Measure                         | _____ Cross Pein Hammer              |